USING TIME-SERIES APPROACHES TO IMPROVE LANDSAT'S CHARACTERIZATION OF LANDSCAPE DYNAMICS

Project update, February 2013, by Kennedy.

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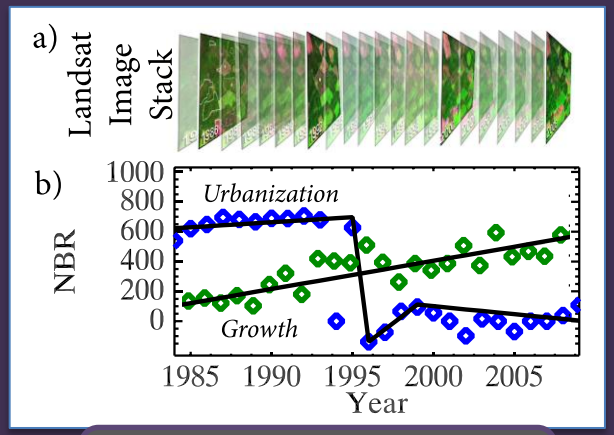
Overall framework for landscape dynamics



Temporal segmentation

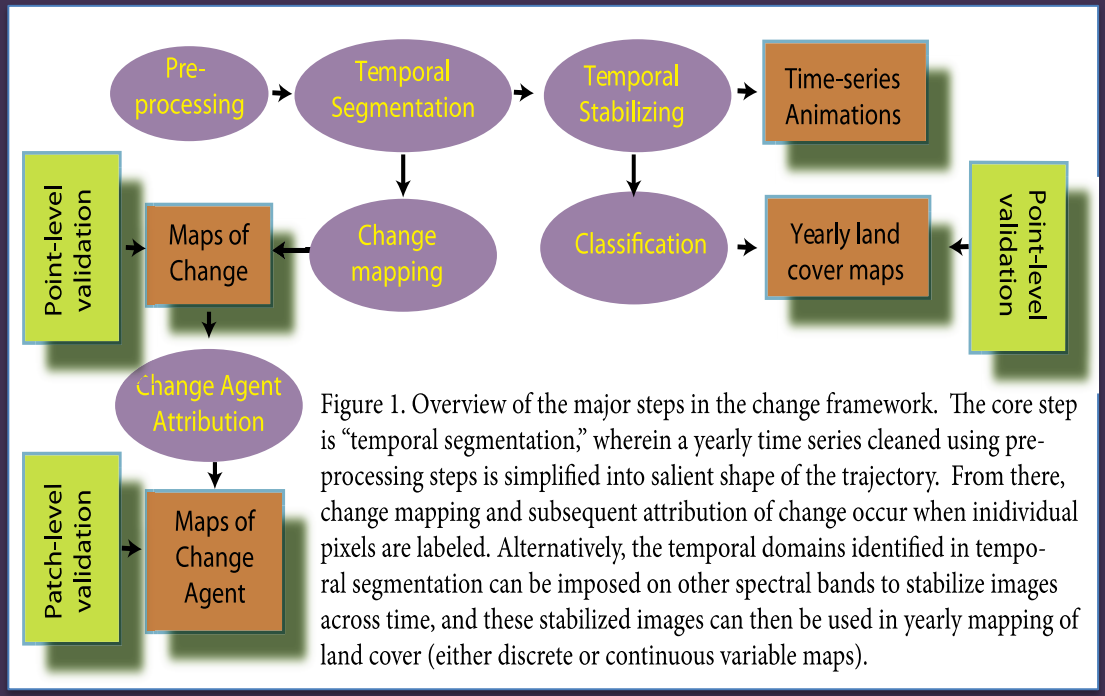


Figure 1. Overview of the major steps in the change framework. The core step is "temporal segmentation," wherein a yearly time series cleaned using pre-processing steps is simplified into salient shape of the trajectory. From there, change mapping and subsequent attribution of change occur when inidividual pixels are labeled. Alternatively, the temporal domains identified in temporal segmentation can be imposed on other spectral bands to stabilize images across time, and these stabilized images can then be used in yearly mapping of land cover (either discrete or continuous variable maps).

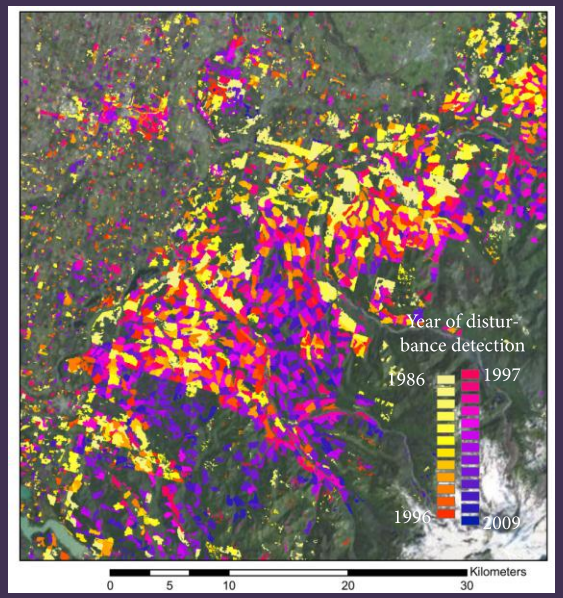
Data density effects

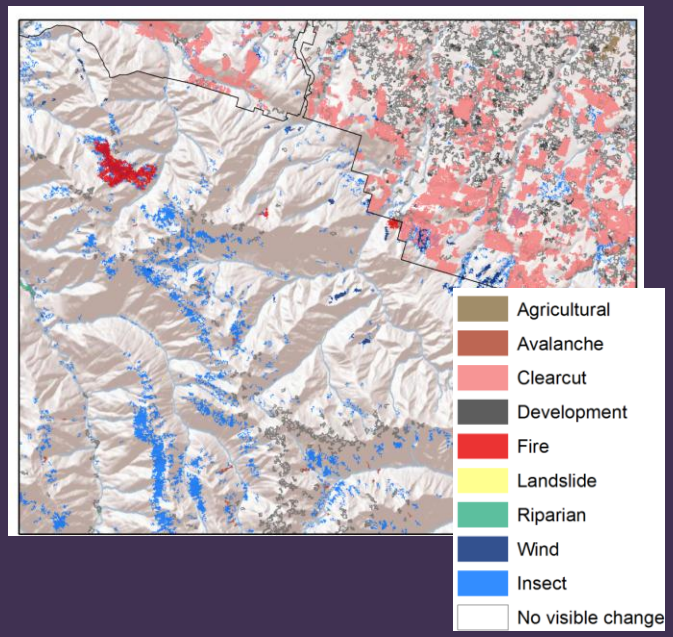
Differences among biomes

Effective incorporation of local knowledge

Consistency

Summary maps of change ↔ Summary maps of change agent ↔ Frequent maps of land cover





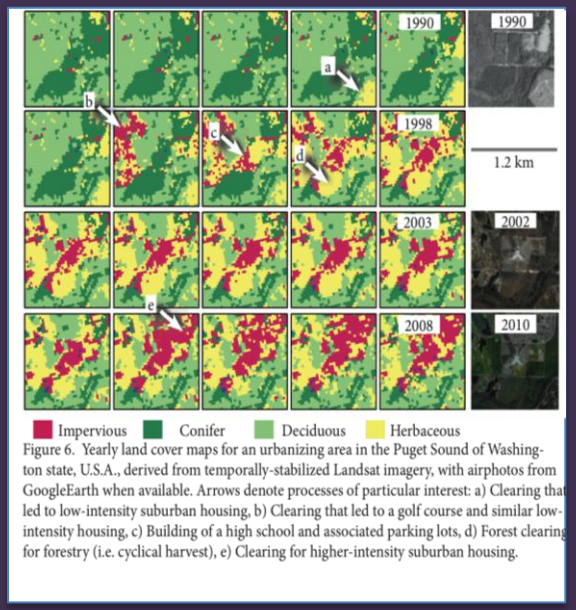


Figure 6. Yearly land cover maps for an urbanizing area in the Puget Sound of Washington state, U.S.A., derived from temporally-stabilized Landsat imagery, with airphotos from GoogleEarth when available. Arrows denote processes of particular interest: a) Clearing that led to low-intensity suburban housing, b) Clearing that led to a golf course and similar low-intensity housing, c) Building of a high school and associated parking lots, d) Forest clearing for forestry (i.e. cyclical harvest), e) Clearing for higher-intensity suburban housing.

New terms needed?

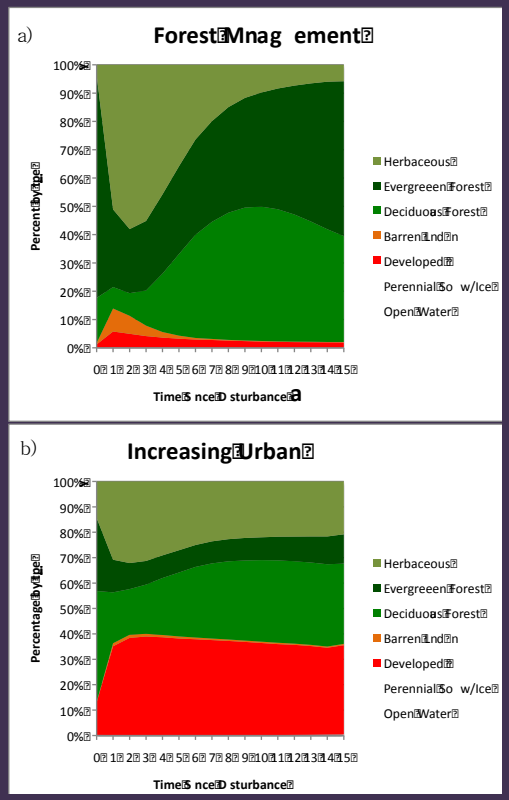
Temporal domain is implicit in some land cover classes

Woody Wetlands—Areas where forest or shrubland vegetation accounts for greater than 20 percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

Cultivated Crops—Areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20 percent of total vegetation. This class also includes all land being actively tilled.

Temporal domain is ambiguous in other land cover classes

Shrub/Scrub—Areas dominated by shrubs; less than 5 meters tall with shrub canopy typically greater than 20 percent of total vegetation. This class includes true shrubs, young trees in an early successional stage, or trees stunted from environmental conditions.



Temporal domain may also need to be included in more "stable" classes?

Project timeline

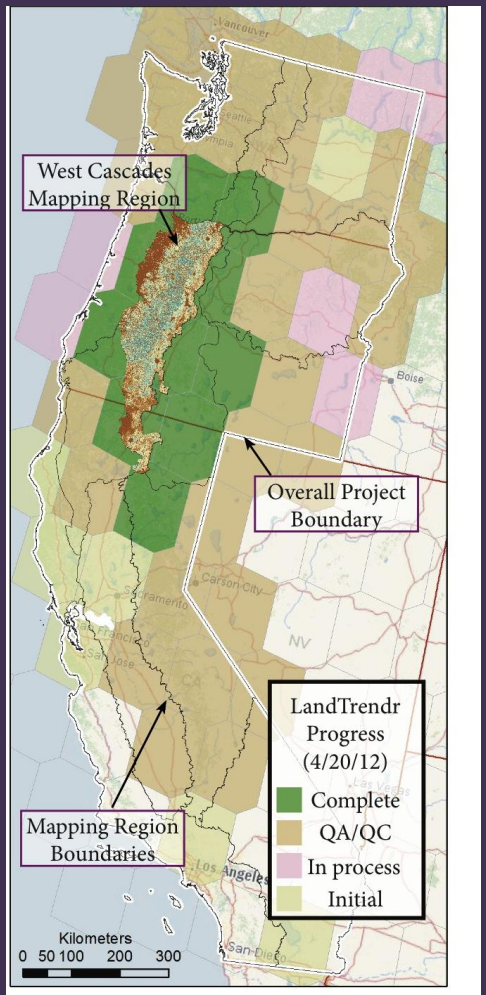


Figure 9. Status of LandTrendr image processing and segmentation for a three-state area in which change framework integration is proposed to begin.

Year 1: Establish framework in WA, OR, CA

Year 2: Test data availability issues framework in WA, OR, CA;
Expand to Temperate deciduous biome

Years 3-5: Incrementally add boreal forest/tundra, wet and dry tropical, arid shrubland, temperate grassland, and coastal